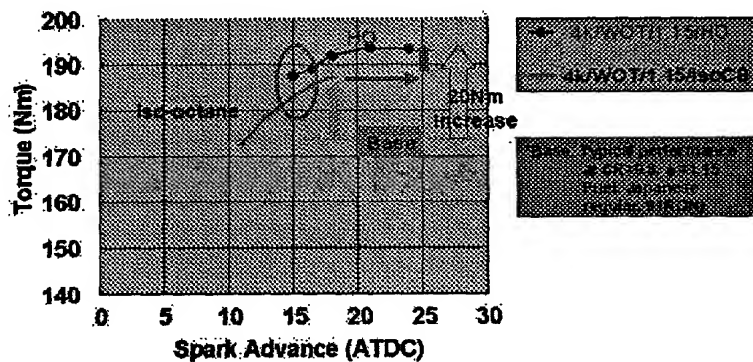


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Figure 1: Torque Performance (4000WOT, CR=13)

Iso-C8 (100RON / 100MON) Fuel "HO" (103RON / 93MON)



Fuel HO reaches MBT

Torque jump at constant SA → Effect of enhanced burn rate

[illegible]

CR=13.0 / Iso-C8 & DF-2/ 4000rpm WOT

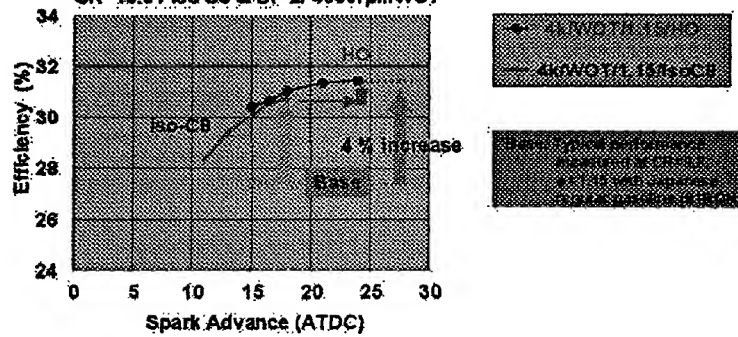


Figure 3: Burn Rate and Heat Release Rate

(4000WOT, CR=13,  $\phi=1.15$ , SA=16.5)

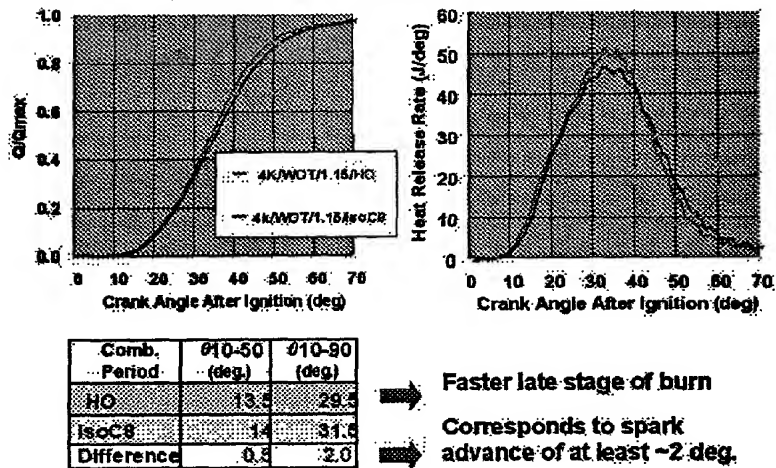


FIGURE 4

1200 rpm, 12mm<sup>3</sup>/st: Inj. Timing Dependence - Torque -  
Spark Timing: 23 deg BTDC

◆ LFG-2B/e13/ $\phi$ 0.52  
 ■ DF-1813/ $\phi$ 0.52  
 ○ LFG-2B/e9.8/ $\phi$ 0.52/TMC Data

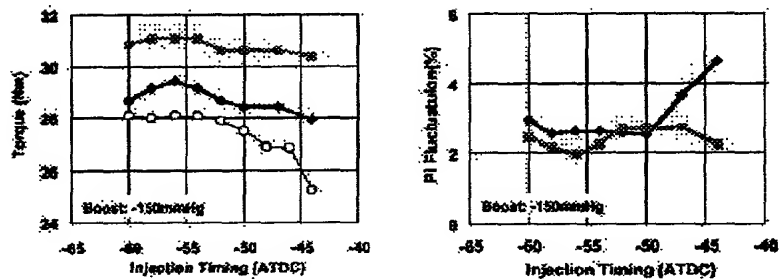


FIGURE 5

1200 rpm, 12mm3/st: Inj. Timing Dependence - Emissions -

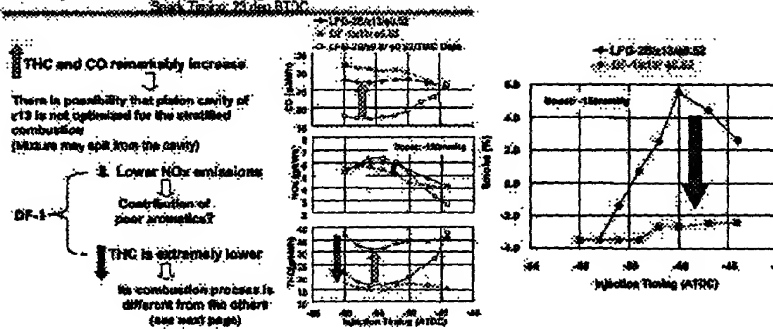
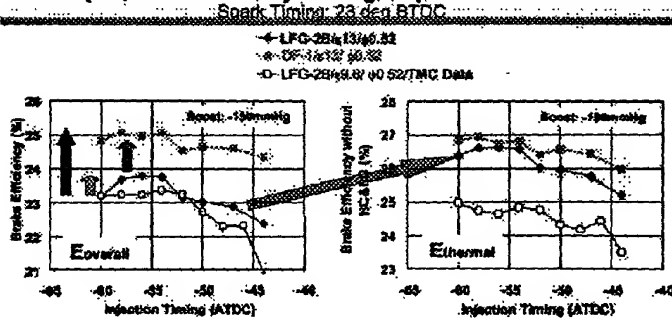


FIGURE 6

1200rpm, 12mm3/st: Inj. Timing Dependence - Efficiencies -



Efficiency: 49.3 => 50.8 ~1.5% UP

LFG-2B => DF-1 ~1.5% UP

Total ~7% UP

Note: Credit from the base (49.3) is dependent value because the base data were measured at 7MC bench with another engine.

The brake efficiency of r13 series is deteriorated by its higher THC and CO emissions.

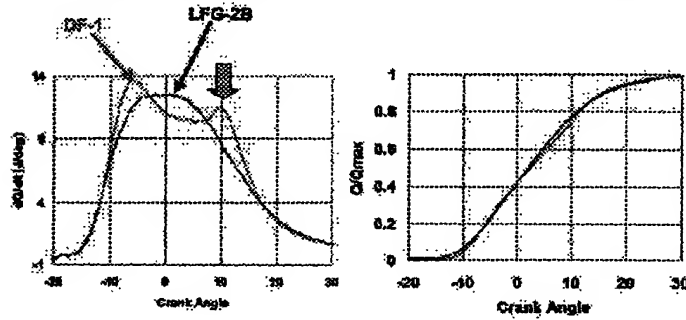
Combination of SICI and low RON aromatics poor fuel is effective for high compress D4.

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FIGURE 7

1200 rpm, 12mm<sup>3</sup>/st: Heat release patterns

Spark Timing: 23 deg.BTDC, Inj. Timing: 54 deg.BTDC



In the case of DF-1 with  $\phi_{13}$ , SIC (Spark Induced Compression Ignition) is occurred.

FIGURE 8

3000 rpm, 18mm<sup>3</sup>/st: Inj. Timing Dependence - Emissions -

↑ THC and CO remarkably increase:  
There is possibility that piston cavity of  $\phi_{13}$  is not optimized for the stratified combustion.

↓ DF-1 { Lower NOx emissions  
Contribution of poor atomization?

↑ NO of DF-1 is similar to that of LFG-2B at the same spark timing.  
SIC? Does not occur (see next page).

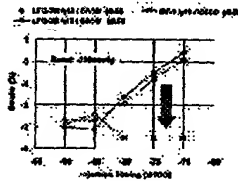
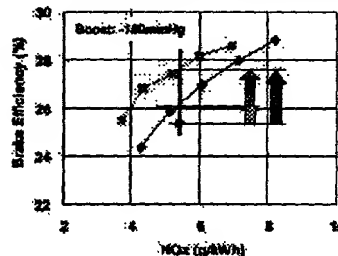


FIGURE 9

3000rpm, 18mm<sup>3</sup>/st : Credit in Efficiency

Injection Timing: 80 deg BTDC

- ◆ LFG-2B  $\phi$ 13 / inj80 /  $\phi$ 0.56
- DF-1  $\phi$ 13 / inj80 /  $\phi$ 0.56
- LFG-2B  $\phi$ 8.8 / inj80 /  $\phi$ 0.56 / TMC DATA



Efficiency:

$\phi$ 8.8  $\Rightarrow$  13 ~3% UP

LFG-2B  $\Rightarrow$  DF-1 ~5% UP  
(not under equivalent NOx level)

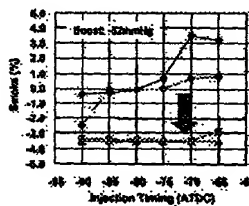
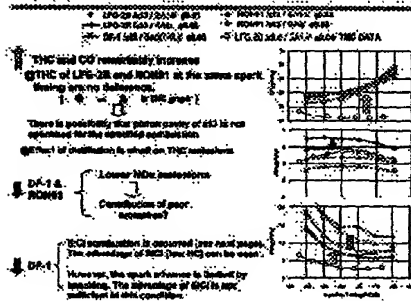
Total ~8% UP

Above credit is not universal

It is not better way to retard  
spark timing in order to reduce  
NOx emissions.

FIGURE 10

2400 rpm, 24mm<sup>3</sup>/st : Inj. Timing Dependence - Emissions

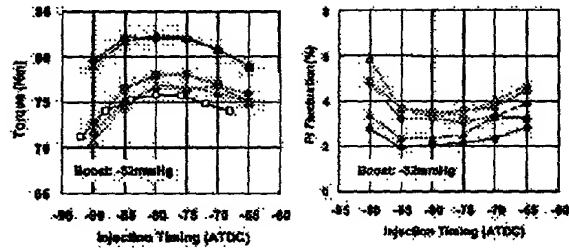


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FIGURE 11

2400 rpm, 24mm<sup>3</sup>/st: Inj. Timing Dependence - Torque -  
Equivalent Boost and  $\Phi$

- LFG-2B / $\epsilon$ 13 / SA14 /  $\Phi$ 0.63
- LFG-2B / $\epsilon$ 13 / SA9 /  $\Phi$ 0.63
- DF-1 / $\epsilon$ 13 / SA8(TKL) /  $\Phi$ 0.63
- RON91 / $\epsilon$ 13 / SA14 /  $\Phi$ 0.63
- RON91 / $\epsilon$ 13 / SA9 /  $\Phi$ 0.63
- LFG-2B / $\epsilon$ 9.8 / SA14 /  $\Phi$ 0.64 / TMC DATA

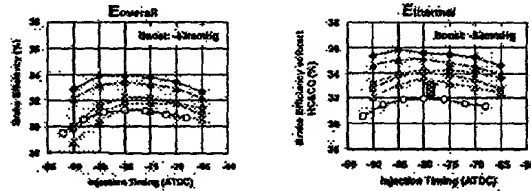


$\epsilon$ 13 series shows higher torque.

FIGURE 12

2400rpm, 24mm<sup>3</sup>/st: Inj. Timing Dependence - Efficiencies -

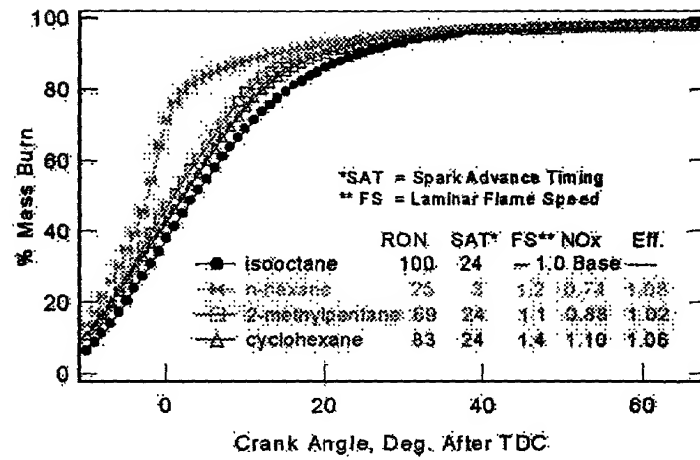
- LFG-2B / $\epsilon$ 13 / SA14 /  $\Phi$ 0.63
- LFG-2B / $\epsilon$ 13 / SA9 /  $\Phi$ 0.63
- DF-1 / $\epsilon$ 13 / SA8(TKL) /  $\Phi$ 0.63
- RON91 / $\epsilon$ 13 / SA14 /  $\Phi$ 0.63
- RON91 / $\epsilon$ 13 / SA9 /  $\Phi$ 0.63
- LFG-2B / $\epsilon$ 9.8 / SA14 /  $\Phi$ 0.64 / TMC DATA



Credit in efficiency will be discussed on later page

The brake efficiency of  $\epsilon$ 13 series is deteriorated by its higher THC and CO emissions

FIGURE 13



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FIGURE 14

